



Ministry of Foreign Affairs

Aquaculture business opportunities in Morocco for Dutch entrepreneurs

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1. Executive Summary

Moroccan marine aquaculture has shown a fast growth in the 90's when production increased from around 500 tons in 1991 to around 1300 tons in 1995. The Marost company in Nador was responsible for almost all of this growth. After 1995 production levels fell gradually to 700 tons in 2001, after which they started to increase again. When the Marost company went broke the marine aquaculture production in Morocco¹ went down from 1440 tons in 2005 to 291 tons in 2006 and never recovered to the previous production levels. Latest estimates of the production levels of marine aquaculture are less than 500 tons/year in 2014 – 2017 with oysters and seabass being the sole two products responsible for the entire production.

In 2009 the Moroccan government launched Plan Halieutis with the objective to achieve a marine aquaculture production of 200,000 tons/year in 2020. A special agency called ANDA tries to realize these plans through facilitating companies in obtaining production rights in pre-defined places along the Atlantic coast and the 500 km of Mediterranean coast. ANDA also stimulates marine aquaculture development through supporting pilot projects (seaweed and mussel farming in the Mediterranean), through providing a legal framework (Moroccan code of marine aquaculture) and by an Investment convention providing tax advantages and simplifying administrative procedures.

Continental aquaculture production levels are not very well recorded, but according to FAO, the production level has increased from 2,500 tons in 2005 to around 15,000 tons in 2015. Most of the production of continental aquaculture comes from carp production in reservoirs (dams), lakes and rivers. Restocking levels in these waters were raised from 2 million fingerlings in 2005 to 11 to 14 million pieces per year in 2015 – 2017. Actual fish production levels in reservoirs, lakes and rivers is estimated in 13,000 tons/year. In fact, this fish is caught by fishermen and more correctly could be marked "aquaculture-based fishery" instead of aquaculture. The remaining production of continental aquaculture is constituted by eel (actual production level estimated in 350 tons/year), tilapia (around 200 tons/year), trout (100 tons/year) and an unknown production by reservoir fishery of carp and other species. The Haut-Commissariat aux Eaux et Forêts et à la Lutte contre la Désertification (HCEFLCD) states in its strategic plan 2015-2024 that they want to focus on production in rural areas and increase production from the actual level of 15,000 to 50,000 tons/year in 2024.

National agencies implementing governmental policies to increase Moroccan aquaculture production make clear statements about their objectives. However, as far as could be determined during this study, they do little reflect on strengths and weaknesses of the actual sector and they don't elaborate much on the causes of aquaculture failures in the past.

While in fact most of Moroccan aquaculture production is realised in fresh water, by some people production of carp, trout, tilapia (and eel to a lesser extent) is not even considered to be aquaculture. In marine aquaculture it seems that not always culture of algae is included in the production figures (at least in 2016 and 2017 there has been some tens of tons of seaweed production at Marchica near Nador). In fresh water (continental) aquaculture it seems disputable that all the carp apparently produced in the wild (13,000 tons per year) are attributed to aquaculture (it might well be that this is fishery supported by a restocking programme). At present it seems that in 2017 continental fresh water aquaculture is both in volume and value bigger than marine aquaculture. Production volume in fresh water (trout, eel, tilapia) is around 700 tons/year plus potentially 13,000 tons of carp. Production volume in marine aquaculture (seabass and oyster) is less than 500 tons. The impression is that Moroccan aquaculture are not always correctly reporting production levels, but are also generally underreporting. Nevertheless, both in continental and marine aquaculture there is little evidence that production levels in recent years are increasing at such levels that the production goals (50,000 tons/year for continental aquaculture and 200,000 tons/year for marine aquaculture) may be reached anywhere in the near future.

Endowed with a favourable sub-tropical climate and a long coastline and 120,000 ha underexploited large fresh water resources, it seems obvious that Morocco has considerable potential to increase aquaculture production levels in both the marine water and fresh water. Also demand of consumers for fish in Morocco is likely to increase due the growing number of inhabitants (36 million in 2017, 39 million forecast for 2025) and also because per capita fish consumption is envisaged to increase from the present 11 kg/year to 16 kg/y in 2020.

In view of the modest production figures it cannot be denied that Moroccan aquaculture sector is still in its embryonic phase. Notwithstanding this, farming of trout, eel, tilapia, oysters and seabass have some history in the country, production methods have become well-established and adjusted to local circumstances and some qualified personnel is available. At this moment the development of these sectors is inhibited by either shortage of water (trout), biological limitations (eel, oysters) or by marketing bottlenecks (tilapia, seabass). As soon as (market) possibilities will be found, these industries could be upscaled and play an important role in meeting part of the ambitious goals of the Halieutis strategy.

Also seaweed farming might be a sector with potential as it could benefit from easy to implement production methods and make use of the relatively cheap labour. Also farming clams (palourdes) might

¹ The Western Sahara is listed as a non-self-governing territory under Article 73 e of the Charter of the United Nations. Any reference in this report to (the cities in) the Western Sahara should be read in this context. For more information: <https://www.rvo.nl/onderwerpen/internationaal-ondernemen/landenoverzicht/marokko/westelijke-sahara>

be ready for upscaling production (but little info available when writing this report).

The remaining aquaculture businesses seem that novel in Morocco that upscaling may still require considerable investment in time and money. The mussel industry is surely promising, but production is still experimental, present production levels are close to zero and upgrading experimental farming in industrial production of mussels on longlines in open waters will take several years. Micro-algae production in Morocco might be promising, but it is still in very first phase of its development.

Development of continental fresh water aquaculture will be based on developing aquaculture in rural populations based on production of carp (by aquaculture-based fisheries) and tilapia (cage farming in reservoirs in fishermen communities).

Finding the right matches between (a) Moroccan industries wishing to develop and increase production levels on one side and (b) capable Netherlands companies wishing to participate in this development might be facilitated by:

- Taking present ANDA work as a starting point for marine aquaculture development as it lines out very well available sites and production potential of the different aquaculture businesses
- The high ambitions of the Halieutis strategy are difficult to justify in view of the present low aquaculture production figures and trends. Credibility of the Halieutis strategy could be improved by (1) further analysis to make present data complete and more reliable and (2) pointing out clearly all initiatives for new aquaculture production and close monitoring their progress.
- Make existing legal and fiscal requirements for investment and operation of Netherlands companies in Morocco as clear as possible (e.g. clarify contents of “Moroccan marine aquaculture code” and the “Investment convention”).
- Make economic potential of the businesses more explicit, e.g. through a kind of “bankable” business plan as investors will be triggered first on economy of the business (and only after that get interested in production potential).

This study aims at matching requirements of Moroccan partners with potential interest of Netherlands companies and institutes to support aquaculture development in Morocco. Obviously, the marine aquaculture potential in Morocco and the experience in marine aquaculture in the Netherlands could result in mutually beneficial cooperation in several promising projects. Such projects need still to be worked out in detail, but farming mussel, oyster, clams and seaweed seem promising areas for considerably upscaling production (although maybe not always on the short, but medium term).

In fresh water (continental) aquaculture commercial activities are limited to trout, tilapia and eel. Trout farming development is limited by water availability, tilapia by limitations of the market to absorb the produce and eel production is limited by the unavailability of enough glass eels. The bulk of the fresh water aquaculture production is carp production in reservoirs and

lakes. Here the combination of small-scale production units and organization of the production in cooperatives seem not very appropriate for involvement of Netherlands investors. However, it may offer opportunities to support rural development strategies, supply some of the required inputs (cages, fish feed) and provide training for officers required to design and implement the Halieutis strategy in the continental waters.

In both marine (sea bass and other species) and continental (trout, tilapia, carp) supplying fish feed could improve Moroccan aquaculture production. Aquaculture economics do highly depend on fish feed as feed costs are in general in the range of 40 to 70% of the overall production costs.

A list with potential aquaculture business partners in Morocco and the Netherlands is provided in the annexes.

2. Introduction

a. Context

This report is the result of a study on the aquaculture development potential in Morocco and the opportunities they may create for Dutch entrepreneurs. The study was commissioned by RVO The Hague, the Netherlands and the Dutch embassy in Rabat, Morocco. The study was carried out in November 2017 by Magnus van der Meer and Ahmed Yahyaoui. The study included a desk study on Morocco aquaculture sector, a field visit to Morocco from November 6 – 15, a desk study and interviews on Dutch aquaculture sector and its members potentially interested in playing a role in aquaculture development in Morocco.

b. Objective

The objective of this report is to provide entrepreneurs in the Netherlands and Morocco a brief analysis on potential projects that could be mutually benefitting for them, while at the same time contributing to realizing Morocco's ambitious Halieutis strategy to increase aquaculture production.

c. Guide for the reader

This report is written to give the reader a brief introduction to Moroccan aquaculture and potential business opportunities that could be retrieved from it for Dutch aquaculture companies. The business proposals are only indicative and, although some names of companies may be indicated, other companies could well be equally competent. A list of Moroccan companies and Dutch companies can be found in Annex 2 and Annex 3, respectively. These lists are only indicative: other equally competent companies may well exist, but not be named because this study was far from exhaustive. Chapter 7 contains a few potential business opportunities in Moroccan aquaculture for Dutch companies and institutes.

3. Moroccan business climate in brief

a. Economic developments

Socioeconomics of Morocco

In the context of developments in the Middle East and North Africa in the past decade, Morocco has remained stable so far. Although social unrest is sometimes reported (e.g. the unrest in Al Hoceima in summer 2017), it always is contained to a level not really affecting the business climate.

Size and state of the Moroccan economy

Morocco is the sixth largest economy in Africa with a GDP of 101 billion US\$ (2016), an income of 2,832 USD per inhabitant (2016). Morocco has about 37 million inhabitants (2017) and the average life expectancy is 74 years (2015). The unemployment rate in Morocco is just below 10 percent. The government estimates that extreme poverty has been eradicated and the poverty rate was 4.8 percent in 2014. However, GIZ states that in Morocco “almost a quarter of its people, especially in rural areas, live in poverty”.

In the Moroccan economy Services is the largest segment accounting for 54% to the GDP (Table 1). Other important segments are Industry and Agriculture accounting for 23 and 13% to the total GDP.

Table 1 Contribution of economic sectors to Moroccan GDP

Segment	Sector	% of GDP	
Services			54
	Wholesale and retail	9	
	Public administration	9	
	Transport	4	
	Hotels and restaurants	2	
	Others	30	
Industry			23
	Manufacturing	15	
	Construction	5	
	Electricity and water	2	
	Mining	2	
Agriculture			13
Fisheries & aquaculture			2,5
	Fisheries	2,5	
	Aquaculture	0,003	
Other			8
Total			100

Fishing and aquaculture sector

The Moroccan fishery sector is huge with an annual catch of around 600,000 tons of fish for human consumption and 300,000 tons of fish for fish meal production for the production of animal food, such as fish feeds. Morocco is one of the world’s largest producers of sardines and contributes around 3% to the global sardine fisheries catch. The Moroccan fishery sector employs in total around 126,000 fishermen and around 50,000 people working in the processing, transport and trade of fish (data of 2006). While most commercial fisheries can be found in the ports of Agadir and Tan Tan, the largest part of the fish is caught in the south.

In 2015 the aquaculture production was 470 tons of fish and shellfish with a value of around 2 million US\$, contributing only 0.1% of the total value to the Moroccan fishery sector. In the years before 2006 aquaculture production was well above 1000 tons/year. In January 2016 the Ministry of Economy and Finances reported: “The Moroccan aquaculture sector was characterized these last years by an important reduction in its production and by a reduction of the number of aquaculture companies in service”. The closure of the Marost company in Nador in 2006 was the major cause of this drop in aquaculture production.

Economic growth rate

General economic development (GDP) Annual Growth Rate was 4.8% in the third quarter of 2017, which is almost the average growth rate of the last 18 years in which quarterly growth rates have fluctuated between a minimum of 0.5% and a maximum of 9.3%.

Weather is an important factor affecting Morocco’s economic growth as agriculture accounts for around 13% of GDP and 35-40% of all jobs. When after a record harvest in 2015 Morocco was affected by a severe drought in 2016, agriculture production dropped by around 10 percent. Consequently, the overall GDP growth reduced by 1.1 percent in 2016. Non-agricultural growth remained around 3 percent.

In recent years the fiscal deficit reduced to 3.9 percent of GDP in 2016 and the public debt stabilized at around 66 percent of GDP. Exports of Morocco’s new automobile and aeronautic industries show fast growth. Also tourism and remittances (money transferred of Moroccans living abroad) are important sources of foreign currency and contribute together 12.5% tot the GDP. On the other hand, the value of the export of the mining industry reduced due to lower prices for phosphate (which represents 18% of Morocco’s export). The prudent macroeconomic policies have strengthened Morocco’s foreign exchange reserves to over 6 months of imports of goods and services at end-2016.

With good rainfalls GDP annual growth was projected to be 3.8 percent in 2017. However, the drought continued to hamper Morocco in 2017 and this figure is likely not to be achieved. Non-agricultural GDP is projected to rise slightly above its recent trend due to a raising confidence of both consumers and producers. However, these positive developments are unlikely to translate immediately into major improvements in labour market outcomes.

b. Moroccan government

I. Relevant central governmental institutions

The new Moroccan government officially appointed on April 5th, 2017 is to announce a new program to pursue the macro-economic and constitutional reforms, upgrade social services and promote job creation. On local governance, the country has engaged in a broad regionalization agenda that will be further implemented by the new government to focus on local development constraints and turn regions into growth drivers.

The Ministry of Agriculture and Marine Fisheries (Ministère de l'Agriculture, de la Pêche Maritime, du Développement Rural et des Eaux et Forêts, MAPDRE&F) has laid down its national agriculture policy in the Green Morocco Plan (Plan Maroc Vert, PMV). Launched in 2008, the PMV aims at promoting socio-economic development through agriculture. One of its objectives is to move the agriculture sector away from cereal crops and invest in irrigation. As a result of this policy, irrigation systems are common in many rural areas.

The ministry (MAPDRE&F) is responsible for the Moroccan fisheries sector, including aquaculture. Within the Ministry, the *Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification* (HCEFLCD) oversees and promotes inland fisheries and inland aquaculture (aquaculture continentale), while *l'Agence Nationale de Développement de l'Aquaculture* (ANDA) has been created in 2011 to exclusively promote marine aquaculture development.

II. Marine aquaculture plans and institutions

Blue Plan

INRH (Institut National de Recherche Halieutique) is the institute under the Ministry responsible for marine aquaculture and from its headquarters in Casablanca INRH support the marine aquaculture development in line with the contents of the Blue Plan.

The Blue Plan, dedicated to the fishing sector, was launched in 2009 as an ambitious project that reviews the entire structure of the Moroccan fishing sector. The blue Morocco plan defines the various actions to be undertaken in order to align with international standards. This plan aims to improve competitiveness in order to increase its contribution to the national economy. Thus, strategic axes have been put in place to achieve these objectives. Sustainability, performance and competitiveness are the three key words on which the new sector 's vision is based. According to the designers of the plan, the sustainability aspect lies not only in guaranteeing the sustainability of the resources, but also in providing visibility for economic actors likely to invest in the field. which works on 3 strategic objectives:

- Development of sustainable aquaculture:
 - Microalgae (industrial)
 - Macroalgae (cooperatives)
 - IMTA (Integrated Multi-Trophic Aquaculture)
- Sustainable fisheries
- Data collection.

Halieutis strategy to speed up marine aquaculture development

The HALIEUTIS strategy, launched in 2009 as part of the Blue Morocco plan, aims to value and contribute on the long term to the abundant Moroccan fishery resource and to triple the GDP of the sector by 2020 and make it one of the growth factor for the national economy. This plan considers that aquaculture must be a growth engine for two important aquaculture activities, which are fish and shellfish farming.

The "Halieutis Plan" aims to boost the fishing sector turnover by streamlining fisheries practices, strengthening infrastructure and expanding local processing industries. Among the plan's top priorities is to strengthen aquaculture by increased production and improved sustainability of both fish and shellfish farming. The Halieutis Plan refers to marine aquaculture only and foresees the development of industrial aquaculture which will be facilitated by ANDA.

ANDA and marine aquaculture development

In the framework of implementing the Halieutis strategy the Ministry of Agriculture and Marine Fisheries created in February 2011 ANDA. Since then ANDA worked on its mission to develop Moroccan aquaculture by:

- Promoting and supporting investments in aquaculture through the establishment of specific action plans
- Proposing regulatory measures in order to encourage the development and organisation of the aquaculture sector
- Carrying out studies on pilot projects in close cooperation with public and private partners
- Assisting investors in establishing aquaculture projects, and
- Establishing a communication policy to promote Moroccan aquaculture development, including participation in and organisation of special events.

With regard to marine aquaculture specific areas have been appointed where companies are invited to start pre-specified aquaculture businesses. Companies can express their interest in a tender procedure and, if selected, can start to operate in those areas without any additional permits or conditions (e.g. environmental impact studies have already been executed).

On Monday April 14, 2014, contracts were signed to allocate specific parts of the ocean to several companies to start aquaculture activities. Many of these activities find place in the Rif region, among them:

- ✓ A fish farm near Chefchaouen by Kilic Morocco Seafood
- ✓ A fish farm in Driouch province by Aqualho
- ✓ A fish farm in Nador province by "Ocean farm"
- ✓ A fish hatchery in Nador province by "Ocean farm"
- ✓ A fish farm in Chefchaouen province by "Med Hatchery and Fish Farming"
- ✓ A shellfish farm by «Les Moules de la Méditerranée»

At this very moment (November 2017) ANDA has issued several calls for expressions of interest (AMI: Appel a Manifestation d'Interet). Soon (mid November 2017) the AMI in the Mediterranean area (coastal area between Al Hoceima and Tanger) will be completed. Other calls in several Atlantic Coast Areas will follow in the coming years. Kilic, a very large Turkish producer of seabass and seabream, intends to invest many million euros in the Mediterranean fish farming but has apparently not yet initiated execution of their plans.

III. Fresh water (continental) aquaculture plans and institutions

HCEFLCD and continental aquaculture development

The Halieutis Plan only concerns marine aquaculture. For fresh water (continental) aquaculture HCEFLCD made a 2015-2024 strategic plan to develop small scale rural aquaculture businesses. The Centre National d'Hydrobiologie et de pisciculture d'Azrou (CNHP) is in charge to implement this plan. Three general objectives are identified in this strategic plan:

- Making fishing and aquaculture as driver of socio-economic development in rural areas;
- Develop in each region of Morocco a profitable value chain related to fisheries and aquaculture and beneficial to local people;
- Making freshwater fish as a primary source of animal protein in rural areas.

In the framework of implementing the Halieutus strategy HCEFLCD made a 2015-2024 programme to develop small scale aquaculture in which special attention will be dedicated to developing tilapia farming in cages in dams (reservoirs). Demonstration unit for cage farming of tilapia in reservoir with cooperatives. By 2024 rural aquaculture is expected to reach a production of 50 000 tons. Cage aquaculture in reservoirs by members of fishery cooperatives was started in 2016 as a pilot project to demonstrate the feasibility of this technique. Current production is about 30 tons and production expected in 2018 is 200 tons.

A traditional task that will remain important for HCEFLCD is supporting recreational fishing by stocking rivers and lakes with trout and black bass. In this framework they recently launched the "No kill" campaign promoting sport fishing and urging sport-fishermen to return larger catches to the river.

c. Trade and foreign investment regulations

Export regulations

Regulations with regard to facilitating export of Moroccan marine products are:

- Negotiations for a Deep and Comprehensive Free Trade Area (DCFTA) between the EU and Morocco were launched on 1 March 2013. Four negotiating rounds have taken place so far, the most recent in April 2014. The DCFTA will build on the existing EU-Morocco Association Agreement which entered into force in 2000 and created a Free Trade Area between the EU and Morocco.
- The United States and Morocco signed an FTA on June 15, 2004. The Agreement entered into force on January 1, 2006. The United States-Morocco FTA is a comprehensive agreement that supports the significant economic and political reforms that are underway in Morocco and provides for improved commercial opportunities for U.S. exports to Morocco by reducing and eliminating trade barriers.
- With regard to export of fisheries products Morocco has also trade agreements with Turkey, Jordan, Egypt and Tunisia.

Import regulations relevant for aquaculture development

Some of the companies trying to penetrate the Moroccan aquaculture market for the first time, found obtaining Hygiene certificates a difficult hurdle to take when exporting life fish. Fish feeds companies may be required to adjust their feed formulation because feeds containing animal by-products (such as blood meal and feather meal) are not allowed in Morocco. It is generally understood that Morocco does not want to import feeds made with (by-)products from porcine origin as one of its ingredients. However, the prohibition of all protein from land animals in fish feeds makes Moroccan fish feeds either more expensive or nutritionally inferior compared to similar fish feeds in other Mediterranean countries. Especially the more expensive fish feeds for carnivorous fish species such as seabass and trout make Morocco's aquaculture less competitive. In aquaculture fish feeds generally compose 40 to 60% of the total production costs. Hence, the costs and fish growth potential (feed conversion) of a fish feed are of huge importance for the economic performance of any aquaculture business.

d. Access to finance

The second two-year Precautionary and Liquidity Line (PLL) arrangement from the IMF for Morocco of August 2017 will serve as an insurance against external risks. The IMF's is designed to flexibly meet the liquidity needs of member countries with sound economic fundamentals but with some limited remaining vulnerabilities. The PLL provides financing to meet actual or potential balance of payments needs. The fact that Morocco did qualify for PLL assures that the country (1) has sound economic fundamentals and institutional policy frameworks, (2) is currently implementing – and has a track record of implementing – sound policies, and (3) remains committed to maintaining sound policies in the future.

With an exchange rate pegged to a basket of euro and U.S. dollar, inflation remained below 2 percent. The strong connection of the Dirham (MAD) to these currencies may make investors more confident in investing in Morocco. The value of the MAD against the euro varies since 2012 roughly between 10.7 to 11.2 MAD for one euro.

Starting a commercial fish farm requires in general considerable investment to start up, while first income is only generated one year or more after initiating the business. Foreign investment in Morocco is facilitated and the only condition a foreign company to become operational in Morocco is that it will work under Moroccan law. Especially for large projects (invest an amount of at least 100 Million MAD or create at least 250 stable jobs) financing might become attractive through special opportunities created by the Moroccan government to promote specific earmarked economic activities such as marine aquaculture. In general aquaculture is considered by the global banking sector as an area of considerable to high risk, but institutionalised support through ANDA may help investors find support for financing aquaculture projects. In the framework of bilateral agreements between Morocco and some EU countries, companies may finance the acquisition of goods and services originating from the signatory countries.

4. Main trends and developments in the aquaculture sector

a. Importance of the subsector to the economy

Importance of global aquaculture and fisheries

Global aquaculture has shown the last two decades the fastest growth of all agriculture sectors and shows a continuous growth of about 2% per year. With fishery catches relatively stable for decades, in 2014 the point was reached at which more than 50% of the fish for human consumption was produced by aquaculture. The value of global fish farming grows faster with 6% per year due to farming more expensive species. Hence, fish continues to be one of the most-traded food commodities worldwide. More than half of fish exports by value originates in developing countries. As global demand for fish is increasing due to both increasing world population and an increased fish consumption per capita, a continued growth of aquaculture production is expected in the years to come.

The global fisheries harvest of 2017 is estimated to be about 40% under the maximum harvest level in the 1980's. In spite of reducing catch volumes, the value of the global harvest of fisheries continued to grow in value until 2006 due to higher prices per kilo. However, since 2006 the annual fisheries catch is decreasing both in volume and value.

Global total capture production in 2014 was 93.4 million tonnes (FAO 2016 status report). Total capture production in marine waters was 81.5 million tonnes in 2014, a slight increase on the previous two years. In 2012 the global aquaculture production was 90.4 million tons with an estimated value of 144.4 million US dollar. Production of aquatic animals from aquaculture in 2014 amounted to 73.8 million tonnes, with an estimated first-sale value of US\$160.2 billion.

The Moroccan Agriculture sector accounts for 13 percent of GDP, including the 2.5% which is contributed by the aquaculture (0.003%) and fisheries sector (2.5%); see Table 1. The Moroccan fishery sector is huge with an annual catch of around 600,000 tons of fish for human consumption and 300,000 tons of fish for fish meal production for the production of animal food, such as fish feeds. The Moroccan fishery sector employs in total around 126,000 fishermen and around 50,000 people working in the processing, transport and trade of fish (2006).

Aquaculture statistics in Morocco

As continental aquaculture and marine aquaculture are governed by two different institutions (HCEFLCD and ANDA, respectively) which both operate independently from the Ministry, aquaculture statistics tend to be fragmented and incomplete. Also, different institutions tend to use different definitions of "aquaculture". In the next part of this paragraph are presented the best available

estimates for production figures in recent years. In view of the comments above, this report does not pretend to provide reliable figures of production for individual points in time, but rather tries to describe as good as possible trends in production.

To make Moroccan aquaculture statistics more consistent and easy interpretable it is advisable to use always (and only) the commonly used FAO definition (1998) of aquaculture:

„Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated. For statistical purposes, aquatic organisms which are harvested by an individual or corporate body which has owned them throughout their rearing period contribute to aquaculture, while aquatic organisms which are exploitable by the public as a common property resources, with or without appropriate licences, are the harvest of fisheries.“

Application of the FAO definition to Moroccan aquaculture will imply that aquaculture statistics will always refer to fresh water and marine fish farming (tilapia, eel, carp, seabass sea bream, meagre, etc.), shellfish farming (oyster, clams, mussels, etc.), farming crustaceans (shrimp, crayfish, etc) and aquatic plants (micro and macro seaweeds and others).

In continental aquaculture fish produced for stocking purposes (trout species, black bass) seem not to appear in the production statistics. On the other hand, some of the production of carp species in the wild (reservoirs, lakes, rivers) may get excluded from aquaculture because of "being exploited by the public as a common property resource" and hence will become part of inland fishery (and not aquaculture) statistics.

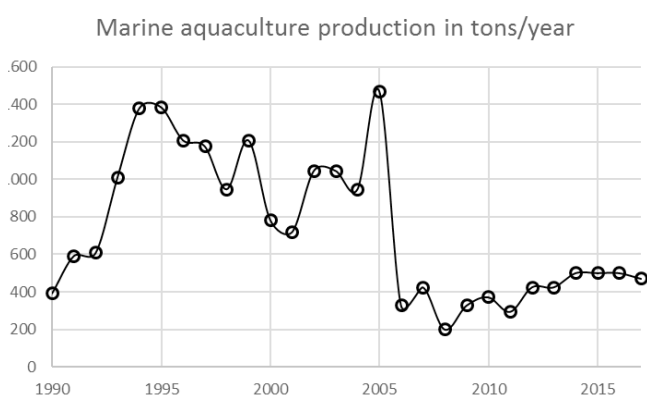
Marine aquaculture in Morocco showed a fast growth in the period 1990 – 1995 when seabass and seabream farming produced in the Mediterranean produced up to 1200 tons/year; see Figure 1. When in the period 2004 to 2009 seabass and seabream production in the entire Mediterranean region (in countries like Turkey, Greece, Kroatie, Italy, France, Spain and Tunesia) increased from 150,000 tons to 300,000 tons/year, the average prices reduced from 7.5 to 6.5 US\$/kg. In 2006 the fierce competition forced the Marost company in Nador to close because it failed to compete with Mediterranean aquaculture companies abroad. As a consequence, the Moroccan seabass and seabream production fell immediately from around 1000 to approximately 30 tons per year and is now (2017) around 200 tons/year.

Oyster production has remained fairly constant since 1990 until now with production of about 300 tons/year, varying between 200 and 400 tons/year. Since 2006 marine fish farming remained always an activity of modest volumes with production not exceeding 500 tons per year; that is less than 0.1% of the national fish production.

The Moroccan marine aquaculture sector consisted in 2015 of 21 companies located in e.g. the lagoon of Oualidia and along the Mediterranean coast. In 2015 the total aquaculture production was estimated to be 470 tonnes. This entire production was sold on the national market and had a value of 20 million dirhams. The marine aquaculture production was dominated by two species: oysters (290 tons; 61% of total production) and seabass (180 tons; 39%). In 2016 some small-scale production of mussels took place in the Mediterranean, but they were not marketed due to regulations restrictions (hygienic code not yet established and implemented). Other non-reported species produced in small quantities were clams and sea weed.

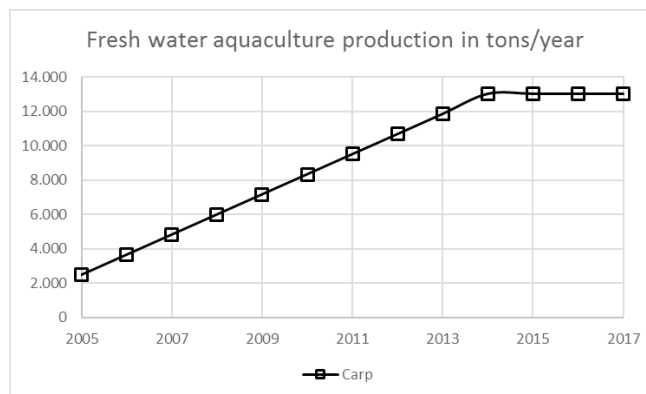
Fresh water (continental) aquaculture in Morocco started in 1924 with farming trout for stocking in the rivers of the Middle Atlas. In the 1980's a programme was developed for reproduction of carp to stock dams and keep them free from weeds. In 2017 continental aquaculture may achieve a production of an estimated 700 tons of trout (200 tons), tilapia (180 ton) and eel (350 ton). FAO reports that fresh water (continental) aquaculture production of mainly carp from aquaculture-based fisheries in dams and lakes increased from 2500 tons in 2005 to around 13,000 tons in 2014, see Figure 2.

Figure 1 Morocco's marine aquaculture production 1990 - 2017



Data: ANDA, data 2014 – 2017 are estimates made during this study.

Figure 2 Carp production from aquaculture-based fisheries



Data 2005 and 2014 from FAO, other data estimates from this study.

Major part of fresh water (continental) aquaculture production in Morocco comes from carp production in reservoirs, lakes and rivers. These water bodies are stocked with fingerlings from the hatchery in Beni-Mellal managed by CNHP (Centre National de Hydrobiologie et de Pisciculture). The Beni-Mellal hatchery produces in principle exclusively for restocking purposes to develop commercial and sport fishing. The hatchery is also used for tilapia reproduction, but is not equipped to produce substantial numbers of tilapia fry for commercial aquaculture. Other species reproduced here are the carnivorous black bass and pike; the claimed annual production of 4 million fry of these two species are all used for restocking.

Carp farming is widespread in irrigation systems, but seems to be executed mainly to maintain irrigation systems clean of plants, rather than producing carp for consumption. The 11 million of fingerlings annually distributed for stocking into dams and irrigation schedules can support a production of several thousands of tons per year. Hence, this carp stocking programme will contribute substantially to the claimed annual catch of 13,000 tons of fish in dams and lakes. As carp is little appreciated by urban consumers, fished and landed on many different sites (hence very difficult to collect data) and (apparently) not considered as essential food for rural population by the government, this production figure seems unreliable. Nevertheless, all indicates that in Morocco carp production must be by far the largest aquaculture produce in volume.

Some characteristics of the farming in fresh water of other species than carp (Figure 3):

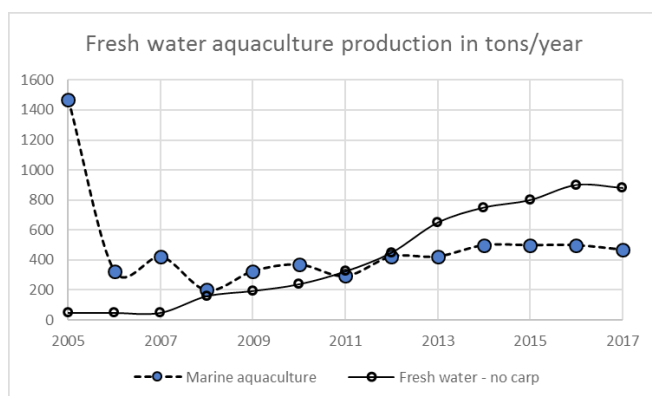
- Farming of tilapia has been performed in Morocco for over 10 years and is important with a production of around 180 tons/year in its major farm and another estimated 150 tons/year production in other farms.
- Eel farming has been established more recently, but achieved an estimated production level of 250 - 300 tons in 2017.
- Trout farming has been well-established in Azrou area with several permanent mountain streams offering good possibilities

for farming of rainbow trout. Brook trout, a native species, might become in the future an aquaculture species of considerable importance for Moroccan trout farming. The present trout production is most estimated to be a few hundred tons per year.

- Continental aquaculture also contributes to sportfishing activities in rivers and lakes through stocking trout (in lakes) and black bass (in dams and lakes). Production levels of black bass and trout for stocking purposes are most likely not very high and seem not to be included in continental aquaculture production figures.

In 2005 when Marost company still produced seabass and seabream, marine aquaculture production was definitely much higher than inland aquaculture production with carp excluded, see Figure 3. However, in 2017 the combined production of trout, eel and tilapia (continental aquaculture) exceeds production of seabass and oysters (marine aquaculture), see figure 3. Although reliable production volumes of continental aquaculture were not available, it is clear that somewhere between 2005 and 2017 continental aquaculture surpassed marine aquaculture production levels, even when carp production is disregarded; in fact, the here estimated production levels for continental aquaculture are probably conservative.

Figure 3 Production of fresh water and marine aquaculture (carp excluded) and compared to marine aquaculture production



Data based on different sources; values must be seen as indicative (guestimates)

Employment in the Moroccan aquaculture sector

Around 460 people have a job in the Moroccan aquaculture sector, of which 200 jobs in marine aquaculture, 120 in continental aquaculture, 50 with the government and 95 in aquaculture sciences and research. Most likely these figures do not include some additional workers in fish processing and trade.

b. (Sub)sector in international context

While Morocco is a major player in fisheries with a catch of 900,000 tons annually contributing 1.1% of the global fishery production (Table 2). In contrast, the Moroccan aquaculture industry is a very small player with an annual production of around 15,000 tons contributing only 0.02% to the global aquaculture production.

Table 2 Morocco's aquaculture and fisheries sector compared to global production

	World tons	Morocco tons	% of world
Fishery production	81.500.000	900.000	1,10%
Aquaculture production	73.800.000	15.500	0,02%

c. Value chain structure

Most of Moroccan aquaculture production is sold as fresh whole fish (tilapia and sea bass). The value chain is generally short and limited to the farm (production and preparation for harvest, harvest and cooling of the product) and transport to retail.

Only Morocco's major trout farm seems to produce a processed (smoked), value added product. Selling tilapia as a fresh whole fish can distinguish the product from imported frozen tilapia and filet from Asian countries.

Oyster preparation and packing in Oualalia is done in one packing atelier used by several oyster farmers.

d. Production

Marine aquaculture production

Production figures for marine aquaculture are given by ANDA as 470 tons in 2015.

Shellfish	Oysters	290 tons
	Mussels	0 tons
	Clams	0 tons
Fish	Sea bass and bream	180 tons

Next to this, in 2016 there was a harvest of 13 tons (dry weight) of seaweed.

Fresh water (continental) aquaculture production

Fresh water aquaculture (continental aquaculture) production figures can be estimated to be around 800 tons in 2017:

Eel	NouneMaroc 200 tons (based on the annual quatum of 1200 kg of glass eels) and others estimated 150 tons (quatum 800 kg of glass eels).
Tilapia	Pisciculture du Nord 180 (2017) to 200 (2016) tons per year, mainly dependent on fluctuations in national demand for tilapia. Also Asmak Nile and cooperative cage farm (30 tons) have produced tilapia.
Trout	Ain Aghbal company has two farms and is responsible for almost all of the trout production volume which is not well known, but probably ranges from 100 to 300 tons/year.
Carp	Silver carp and common carp fingerlings will have been produced in hatcheries in Beni Mellal. Bulk of carp is produced in reservoirs by 'aquaculture-based fisheries', which is not considered aquaculture.

e. Trade and logistics

Morocco enjoys of a very strategical position with Spain (and thus also the EU) at a distance of only 14 km from its northern border. For the young and small aquaculture sector of Morocco, imports of some essential prime materials such as fish feed and seeds (seaweed) spat (oysters) and maybe (improved) fingerlings (tilapia) will remain important. In the past years some Netherlands companies have exported fish feed to Morocco for trout (once only) and eel (regular supply).

Export and import to and from Europe is relatively easy thanks to good access by road to the markets of Spain, France and (among others) the Netherlands.

f. Internal market

Internal market is important

Purchasing power of the Moroccan public is limited. There is however a considerable difference between urban and rural market: while the urban market can absorb more expensive fish species like seabass, trout and oysters, the rural market prefers sardine and other cheaper fish species. It is important to understand the internal market well, as the domestic consumption of fishery products grows by 8% per year in average.

Conservative internal market

Seafood is preferred above fresh water fish species. Carp, being a major aquaculture species in Asia due to its low prices, has not such a tradition in Morocco and seems to be generally little appreciated by the market. Tilapia is not an indigenous fish of Morocco and does not find an easy market: at this moment demand seems to be the limiting factor for tilapia production. Seabass and seabream are easier to sell. For these two species consumer's purchasing power and not demand is limiting production.

Consumers preference for marine fish

The Ministry of Economics and Finances identifies as one potential reason for failed aquaculture projects in the past: "The failure to understand the internal market and the preferences of the consumers". Quite understandably a lot of present efforts in Morocco to increase aquaculture production is focussed on production related issues. However, market related issues will be decisive for projects to be successful in the long run.

Thanks to its huge fishery production, Moroccan consumers are familiar with marine fish and know to appreciate it. In contrast, fresh water fish is rather unknown and considered of inferior quality. However, in inland reservoirs considerable quantities of carp are being produced and it would be interesting to know where and how carp is being sold. Carp is apparently the major locally produced fresh water fish in Morocco, but little is known about its market. For aquaculture development it is relevant to note that tilapia is finding a ready market all over the world, but consumer's acceptance in Morocco seems to be limited. Possibly, consumers consider pangasius imported from Vietnam as a comparable but cheaper product.

The steadily increasing market prices of marine fish may offer fresh water aquaculture fish the opportunity to proof itself as an alternative. Locally produced fresh whole tilapia certainly should have a superior quality compared to imported frozen pangasius fillets. In 2013 the value of the import of pangasius from Vietnam was estimated to be a few million US dollar. Moroccan aquaculture could take the challenge to replace this import by producing its own fresh water aquaculture species for competitive prices.

Products of porcine origin are not acceptable for local consumers. However, in Morocco not only porcine products, but also protein or by-products of any land animal is prohibited to be used in animal feed. This excludes products such as blood meal, feather meal and meat meal from being used in fish feeds. Hence, fish feed costs are higher in Morocco (if more expensive fish meal is used to substitute land animal slaughter residues) or fish feed quality is lower (if the less digestible vegetal products are used as protein substitute). As fish feed costs constitute normally 40 to 70% of all aquaculture production costs, feed costs strongly affect overall productions costs. Hence, Moroccan fish farmers can for this reason compete difficultly in the international (bulk) market with similar (frozen) products from countries such as China, Taiwan, Greece and Turkey. Moroccan farmed fish most likely has to be sold in a niche market, e.g. as a fresh product (not frozen) or sell it as a (certified) halal or organic product.

g. Export

Substantial export of aquaculture products from Morocco seems to be limited to oyster and eel. Eel is a relatively expensive fresh water fish, it is not usually eaten in Morocco and it is finding a good export market in Asia (China, Japan, South Korea). Oyster is a special product with great acceptance worldwide at special occasions. Especially at the end of the year there is substantial export of oysters to Russia, filling the vacuum left when European oyster exports dropped as the row between Russia and the EU over Ukraine developed.

h. Challenges in the value chain

Moroccan aquaculture fish production is mainly sold as whole fresh fish. However, to fully attend the Moroccan internal market probably two different strategies have to be followed:

- one with an assortment of fish and fish products, including prepared, added value products in the cities, and
- one for rural markets where cheaper bulk products might be most successful.

Market strategies, processing and packing may have to be developed to attend these two internal markets of Morocco. So far, in the aquaculture sector there is little experience with developing added value products. Especially for the urban market processing and packing may require adjustments if also the higher end of the market has to be attended.

Creating a niche in the higher end of the market has already been done by Ain Aghbal selling its trout as delicious 19-gram cold smoked appetizers on flights of Air Maroc.

For export purposes farmed fish could be sold as certified halal or organic products. In Europe there might be a market for such products and for certified halal products its Moroccan origin might be an additional advantage for the many European consumers with North African roots. In Europe there is a fast increase in sales of certified sustainable and organic products. For tilapia production in Morocco it seems well feasible to make the required adjustments to produce them according to EU organic standards.

Oysters are by themselves already a product for the higher end of the market. As such they need little additional processing and packing. Just like all shellfish also oysters require permanent control of environment and produce itself on food safety. Both testing production areas by the government (ONSSA, Office National de Securite Sanitaire des Produits Alimentaires) and preparation and control of oysters before export seem to be solidly organised.

In the very young sector of seaweed farming, drying and storage of harvested seaweeds might still require considerable improvement in order to produce high quality product.

i. Aspects of Corporate Social Responsibility in the sector

Corporate Social Responsibility (CSR) in this upcoming sector seems to be of little relevance yet. Once the industry develops into a more mature size CSR might help the industry to either (1) obtain a 'licence to produce' or (2) add value to the company and/or its produce. At present, the entire aquaculture industry of Morocco principally needs to focus all efforts in becoming a larger and economically healthier business. When the Moroccan aquaculture industry becomes mature, CSR is expected to become a valuable tool to distinguish companies and their seafood products from other producers. However, in the present situation Moroccan aquaculture development will mainly depend on finding solutions to economic problems and CSR initiatives are yet considered of limited importance for the success of the individual companies. Nevertheless, in a few cases CSR awareness is already present among Moroccan aquaculture entrepreneurs. Eel fish farmers which are highly dependent on export have incorporated measures to protect the eel stock by annually restocking Moroccan waters with young eels. This practice is in line with regulations as taken by the EU (the Eel Regulation EC 1100/2007). One of the tilapia farmers in Morocco uses green (wind) energy for its production.

j. Geographics

Morocco is endowed with good seawater quality, water temperature suitable for many commercially interesting fish species and some favourable aquaculture sites along the Atlantic coast and the 500 km Mediterranean coast. Apart from sites exposed to high waves and strong currents requiring open ocean fish farming techniques, there are also many sheltered sites in natural bays and lagoons suitable for cage farming of sea bass or producing mussels and oysters. The most recent update of ANDA (2017) indicates there are in total 18 commercial companies active in marine aquaculture (one of them producing fish, the others shell fish) and 3 "projects with a social character" two of them producing mussels and one sea weed. Presently oyster farming is mainly practised along the Atlantic coast around Oualidia, while mussels, seaweed and seabass are produced along the Mediterranean coast roughly between Nador and M'diq (addresses to be found in Annex 2).

With regard to fresh water aquaculture (continental aquaculture) there is potential in farming fish along some of its permanent rivers and in the around 140 dams (with approximately 120,000 ha of water surface) built for water storage. Most of these dams are used for irrigation of agriculture land and offer good potential for integration its present purpose with farming fresh water fish species. Indoor farms with RAS systems require less water and can be found on strategical sites: tilapia farming south of Tanger near the owner's tilapia feed factory and eel farming in Kenitra from which import of feed and export of fish is easy (addresses to be found in Annex 2).

Morocco is strategically very well situated along the border of Europe and has potentially easy access to major (fish) markets in southern Europa such as Spain, Portugal and France.

5. Institutional context

a. Sector policies and regulations

1. Main policies and regulations

Marine aquaculture

In 2009 Morocco's new policy to develop marine aquaculture "Stratégie Halieutis" was launched by his Majesty King Mohammed VI. ANDA (Agence Nationale pour le Développement de l'Aquaculture) was created in 2011 to implement this plan. ANDA is an independent agency operating under the wings of the Ministry of Agriculture and Marine Fisheries. The objective of the strategy is to achieve an aquaculture production of 200,000 tons per year in 2020. Present (2015) marine aquaculture production level is 470 tons/year.

Future development of aquaculture production

Moroccan government is ambitious and wants to make aquaculture a fast growing sector ("Faire de l'aquaculture un moteur de croissance majeur"). According to ANDA the Moroccan marine aquaculture production of less than 500 tons/year in 2007 should increase to 200,000 tons in 2020 (Les ambitions chiffrées à l'horizon 2020, No AMI/MED1/09/12).

ANDA has executed studies on the potential of marine aquaculture development along the Moroccan coast. Based on the studies several zones of interest were assigned. In these zones precisely described areas have been assigned to specific kind of aquaculture to be developed in each area. The idea is that these zones are well suitable for the assigned type of aquaculture and they also fit in the national aquaculture development strategy. As such, in these area entrepreneurs can readily start the assigned type of aquaculture, without the need of extensively working on obtaining the required licenses (among them environmental impact studies). Also, in the framework of this strategy is the lifting of import taxes on aquaculture inputs such as fish feed and young fish.

The areas of importance for foreign entrepreneurs or investors in aquaculture are all together measuring 14,271 ha of sea water surface of which over 9,204 ha destined for shellfish farming (either oysters, mussels, clams or abalone), 3,335 ha for fish farming and 1,732 ha for seaweed farming (see Table 3).

Seaweed production

Morocco is one of the major red seaweed production areas of the world and was until 2006 the global number 1 exporter of red seaweed. The collection of the weed takes place in the summer months along the ocean coast around Al Jadida in waters up to 25 meters deep. Harvesting seaweed by divers is a dangerous job, but nevertheless, this industry was economically interesting and harvest increased to 14,000 tons in 2009. This overharvesting was halted when INRH raised the alarm and a quatum was set of 6040 tons per year with a value of around 31 million euros.

The agar agar produced from the weed is high quality gelatine with in general a higher quality then the gelatine from animal origin and with a wide acceptance as it also is suitable for vegetarians and religious groups banning pork. Of Morocco's seaweed 80% is processed in Kinitra for agar agar production (the remaining 20% is exported).

So far, seaweed is exclusively collected from nature and aquaculture of seaweed (as far as known) is only practised in Marchica, Nador. The 1732 ha of sea destined for seaweed farming could highly contribute to seaweed production in Morocco, as harvests can be as high as 12 tons (wet weight)/ha/year.

Apart from overviews of potential aquaculture production sites and make this information accessible to potential producers, ANDA also undertakes the following activities:

- supports pilot projects of fishing cooperatives in the Mediterranean (e.g. Cala Iris and Marchica),
- works on a "Moroccan code of marine aquaculture" to establish a framework matching international standards and ensuring a total transparency as far as the aquaculture sector management is concerned, and
- supports creating a positive investment environment through an investment convention which includes:
 - alleviation and sharing out of tax burden
 - providing a preferential tax regime
 - simplifying administrative procedures
 - promoting free zones and free industrial storage regime.

Table 3 Some areas destined by ANDA for shellfish, marine fish or seaweed production

	Region	Shellfish		Fish		Seaweed		Total	
		units	ha	units	ha	units	ha	units	ha
1	Tanger-Tetouan-Al Hoceima	18	310	18	510			36	820
2	Region Oriental	12	180	49	1.225	4	60	65	1.465
3	Guelmim-Oued Noun	48	720	24	600			72	1.320
4	Region Sous Mass	210	3.150	24	600	24	360	258	4.110

Brand new shellfish hatchery and laboratory in Amsa

In Amsa (Mediterranean coast) a new laboratory and shellfish pilot farm is under construction. This project will operate as part of INRH (Institut National de Recherche Halieutique).

Micro-algae production in development in Agadir

INRH also promotes micro-algae production. A consortium of UK, South African and Moroccan companies is developing south of Agadir a farm of 8000 ha of ponds to produce microalgae. Of the potentially 100 interesting species, 8 have now been selected to be produced from March 2018 in the first 3 ha of ponds. Total investment here is expected to reach 415 million US\$ and 100,000 ton of dried algae could be produced by 2022.

Continental aquaculture

The strategic plan of the Haut Commissariat aux Eaux et Forêts et à la Lutte contre la Désertification 2015-2024 aims to develop new production system for the benefit of the local population that are economically and ecologically sustainable makes continental aquaculture an important source of animal protein in rural areas. In 2024 the production of inland aquaculture should have reached the level of 50,000 tons/year (actual production in 2017 estimated in around 15,000 tons per year).

II. Challenges with regulations and policies

The Moroccan aquaculture industry depends on the import of oyster seed (spat) and fish feed (especially in cases where standards have to be high such as for the younger fish or eel). Imports are not always easy, due to complicated clearance protocols. However, it seems that importing is especially difficult for new products to arrive at the Moroccan border, while for repetitive imports of the same product the processes become smoother and more reliable. For exporters it is very important to have an experienced and well-informed Moroccan importer.

For import of fish feed restrictions on ingredients are tough as the use of all products from land animal origin is prohibited. Fish feed would be cheaper (and Moroccan aquaculture sector more competitive) if restrictions on fish feed ingredients would be limited to the prohibition of products from certain animals (such as porcine species) while products from other land animals (such as cows and chickens) could be allowed.

With regard to the aquaculture development policies the challenge will be to adjust growth level expectations to more realistic values. It may help to specify levels for certain products and certain areas for short terms (few years max.) in co-operation with the potential producers or those responsible at the local level. In this way aquaculture development policies could get a wider support in the aquaculture community and, consequently, become more efficient.

According to the Ministry of Economy and Finances (2016) among factors hindering investment in Moroccan aquaculture is the complexity of acquiring real estate.

b. Public sector partners

I. Research and Education

To stimulate the aquaculture development young professionals will be needed. Some of the institutions offering education in aquaculture are:

- The Mohammed V university in Rabat offers an aquaculture course which is mainly theoretical, but contains also a few days of visiting aquaculture farms.
- The Hassan II Agronomic and Veterinary Institute (IAV) in Rabat has been offering for more than three decades a well-structured education on fisheries science and aquaculture with a fully dedicated department and research lab. After the two first year of engineering studies, an average of 25 students per year follow a 36 months program to have a master degree in Fisheries/ aquaculture. An exchange program already exists with European universities, especially Belgium, and can include also the university of Wageningen which already have a history of collaboration with the IAV.
- Interestingly, the University of Larache/Tanger is already involved in research programmes executed in co-operation and co-financed by aquaculture entrepreneurs.
- The ENFI (Ecole Nationale Forestière d'Ingénieurs) is also offering course modules for students who would like to specialize in pisciculture.

II. Ministry of Agriculture

Within the Moroccan government the Ministry of Agriculture and Fisheries (Ministère de l'Agriculture, de la Pêche Maritime, du Développement Rural et des Eaux et Forêts) has created two bodies to promote inland aquaculture HCEFLCD (Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification) and marine water aquaculture (ANDA).

III. Development partners

JICA

Japan (JICA) is traditionally an important partner in developing Moroccan aquaculture. In M'diq they are involved already for decades in developing and exploitation of aquaculture research facilities. While it is claimed not to be easy work with them (as they tend to stick to techniques used in Japan and are little eager to adopt to Moroccan conditions), they offer money and technical assistance without difficult conditions. In the Moroccan aquaculture sector Japan is generally considered to be a fairly easy and generous partner to cooperate with. EU is considered as a more flexible partner, but also delivering only very small amounts of money (mini-projects, such as those financed by GIZ).

GIZ

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH) has been working in Morocco since 1975 and opened an office in Rabat in 1999. GIZ is taking on commissions in Morocco

from other clients, such as German Ministries and institutions, the European Union and Moroccan companies. GIZ has 130 staff in Morocco. Their major project in Morocco was focussed on climate change (2013-2016). Development of fish farming in 2 reservoirs (Hansali et Hassan II), supporting sustainable management of fish stocks (Bin El Ouidanne et Hassan 1) and fish farming in cages with cooperative Tamaroute.

Cooperatives

Cooperatives are regular participants in aquaculture development in Morocco. The Moroccan development strategy for small scale farming of seaweed and tilapia seems to be mainly targeted to fishermen organised in cooperatives. In development strategies of continental aquaculture local populations are important targets, either as producers (e.g. cooperatives of fishermen are seen as the potential farmers of tilapia in cages in reservoirs) and as consumers of affordable animal protein from fish.

Potentially, NGO's could be suitable organisations to support development of rural aquaculture in Morocco but, as far as we know, their role is still very limited.

c. Private sector partners

The strongest partners in the Moroccan aquaculture sector are the private companies. All considerable investments so far done in aquaculture production are from private partners: the Domaines Royal in trout, NounéMaroc in eel and Ostrea in oysters and Pisciculture du Nord in tilapia.

Some of the key private partners of interest for aquaculture development are mentioned in Annex 3.

6. Safety and security

a. Social and economic safety

Safety is at present (Nov 2017) no big issue (*see Chapter 2, paragraph a.*) and Morocco can be considered a rather safe place to work and live. Also the economic growth is rather stable (*see Chapter 3, paragraph a*) and Morocco is also internationally considered a generally well-governed economy. Hence, Morocco provides investors with a relatively good business climate.

b. Fish hygiene considerations

The Moroccan fish industry is quite familiar with European quality and hygiene standards. Large shrimp ateliers in the north of Morocco deliver exclusively products of the highest quality standards.

With regard to the local market: lot of the fish is sold in the open air on markets which are generally far from being clean and tidy.

With regard to the hygienic conditions at production, processing and packing of food in Morocco, the ONSSA (Office National de Securite Sanitaire des Produits Alimentaires) plays a key role. In the area of aquaculture they qualify production areas (Classement des zones de production des coquillages du littoral marocain) and producers, processors and exporters of shellfish (Liste des établissements agréés pour le conditionnement, l'expédition et la transformation des mollusques bivalves vivants au Maroc). So far, no specific rules have been elaborated for fish farms. However, when importing fish or fish feed, strict rules are applied and enforced. When importing animal feed these rules require that the feeds "do not contain any trace of animal meal". In practice this turns out to be a serious bottleneck for fish farmers in Morocco, as the products substituting the prohibited animal meal are either more expensive or are of less nutritional value for fish.

c. Insurances

In general aquaculture is considered an enterprise of considerable risk. Climate, disease and technical failures can cause havoc at any time if not well-prepared. Part of this risk is usually integrated into the business plan of the operation by assuring that sufficient capital is reserved for unexpected costly events. However, other part of the risk should be covered by insurances. It seems that insurances in Morocco charge around 30% more than in surrounding countries.

Compulsory health insurances for workers in fisheries are very recently agreed upon.

7. Business opportunities

a. SWOT analysis of Moroccan aquaculture

Business opportunities depend on many factors related to economics, business climate, available qualified and unqualified personnel, environmental issues and market opportunities for specific fish products.

Some of the main reasons stated why one would consider investments in Morocco are:

- Cost competitiveness
 - Only 14 kilometres from Europe
 - Low wages (average wage around €330/month)
 - Cheap to export (600US\$/container).
 - Stable macro-economic performance
- Free trade access to one billion consumers (in EU, USA and other countries).

A listing of some of the factors affecting the aquaculture business potential in Morocco are summarized in the following SWOT analysis:

Table 5 SWOT analysis of the Moroccan aquaculture sector

Strengths		Weaknesses	
1	ANDA institute specially created for aquaculture development	1	Competitiveness local farms is weak because import taxes for fish farm inputs, while import of farmed fish for human consumption is free of VAT (corrected since 1/1/2018 ?)
2	Cheap labour abundantly available	2	Fish feeds expensive in Morocco because no land-animal products can be used
3	Very close to huge fish market (Spain and rest of EU)	3	Complexity in assessing real estate in Morocco
4	Considerable fishery and fish processing sector	4	Limited understanding of internal market and consumers
5	Small but solid eel farming sector	5	Fragmented market (urban and rural market differ highly)
		6	Many fresh water fish farming technologies outdated
		7	Economy of scale not favourable due to small sector
		8	Imports in Morocco complicated for first-time importers (and foreign exporters)
		9	Aquaculture sector not organised
		10	Spats (oysters) and fingerlings (seabass) have to be imported
		11	Availability of fresh water for trout and tilapia farming is limited
		12	Aquaculture planning topdown organised/private sector involvement could be improved/ potential fresh water aquaculture overlooked
		13	Risk insurances 30% higher than in neighbouring countries
		14	Limited availability glass eel make growth eel sector impossible
Opportunities		Threats	
1	Demand for fish in Morocco continues to increase: increased population and higher per capita consumption	1	Biotoxins may appear in M'diq and other areas
2	Trade agreements with major fish markets as EU, USA and Turkey	2	Limited acceptance of new products by consumers, e.g. tilapia
3	Import duties to be reduced to only 2.5% as of 1/1/2018		
4	Easy to occupy areas for marine farming through AMI procedure		
5	Government investing heavily in new research and production facilities in shellfish and seaweed		
6	Producing fingerlings for stocking reservoirs for fishery (carp, tilapia) and sport fishery (black bass, trout) may not yet be fully exploited.		
7	Fishfarming using little water by integration with agriculture irrigation is well possible and desirable (tilapia in cages, carp in reservoirs, introduction RAS systems)		

b. Business opportunities

1. Tilapia farming opportunities in water management

Morocco possesses 140 dams storing run-off waters in reservoirs with a total surface of 120,000 ha. These dams are of extreme importance for agriculture as few rivers have a sufficient permanent flow to sustain irrigation systems. Apart from the government-built dams there are many small dams built by private farmers.

There is a GIZ project supporting HCEFLCD to increase rural tilapia farming in dams and ponds. This project aims to improve living conditions in rural areas by providing more people with income and sufficient animal protein in their diet.

As water scarcity is a serious problem, fish farming should be designed such as to save as to consume as little as possible water. Cage farming in lakes may affect water quality, but has virtually no impact on water consumption. Cage farming in lakes seems also suitable as a new activity for fishery communities. Tilapia farming in ponds can be carried out minimizing water losses by integrating it with irrigated agriculture activities. Water from fishponds can be used for irrigation of fruits, vegetables and other crops. When properly integrated the fish pond will not only supply agriculture plots with water, but also with extra nutrients. Also mud from fishponds can be used as a fertilizer.

Tilapia is a relatively easy to farm fish, is widely used in small and large-scale fish farming and can be kept under a large variety of holding systems. Economics of tilapia farming still require more study, as consumer's acceptance of tilapia might be limiting sales and keep tilapia prices low.

Opportunity:

- ✓ present tilapia strains for stocking purposes of limited quality (genetically not well maintained)
- ✓ local Tilapia feed of limited quality
- ✓ farming tilapia might be first step in development rural aquaculture providing work and food in rural areas
- ✓ Interest of GIZ (German agency) in developing this type of aquaculture in Morocco
- ✓ Interest from skilled Moroccan entrepreneur in developing tilapia hatchery, could also support farmers in fish farming management

Dutch opportunities:

- ✓ Delivering tilapia hatchery /farm equipment
- ✓ Supply (red) tilapia fingerlings
- ✓ Tilapia feed, especially first feeds

Moroccan partner(s):

- ✓ HCEFLCD,
- ✓ GIZ Morocco
- ✓ Mohammed V university
- ✓ Asmak Nile
- ✓ Pisciculture du Nord
- ✓ Aliments et proteines du Nord

2. Commercial tilapia farming

Tilapia is a fish species indigenous in almost entire Africa.

In Morocco the fish has been introduced about 10 years ago. This decade of tilapia farming has resulted in selection of a local tilapia strain adapted to the local farming conditions and reproducing and growing well in the (northern) Moroccan climate. The national market absorbs a volume of 180 to 200 tons of fresh whole tilapia per year. For this specific product it seems difficult to increase national demand and this limits production: if demand would be higher, production could increase easily. To move away from this status quo, production costs of tilapia farming should be reduced and tilapia should be marketed in a bigger assortment of products (added value).

Sales potential of local produced tilapia imports has to be estimated against a background of considerable imports of cheap pangasius filets from Asia. Locally produced fresh tilapia could easily beat this product in quality, but not in price. Also, the EU market could be explored: a fresh product instead of frozen, and also the potential of exporting tilapia as a certified halal or organic product could be exploited.

Key factors to competitive tilapia production in Morocco might be strategic location of the farm (e.g. close to market, safe and cheap water supply, area with low energy costs) and, compared to present practice, improved fish feed and fish farm design.

Dutch opportunities

- ✓ Upgrading tilapia recirculation system (RAS) to reduce production costs
- ✓ Technical support for tilapia fish feed production
- ✓ Fish feed sales
- ✓ Delivering tilapia fingerlings of improved quality
- ✓ Certification of tilapia farming as organic or halal

Moroccan partner:

- ✓ Pisciculture du Nord
- ✓ Asmak Nile
- ✓ HCEFLCD
- ✓ Aliments et proteines du Nord

3. Education and training in aquaculture

Mohammed V university in Rabat showed interest in developing a laboratory for inland aquaculture to support its fish farming course. Other Moroccan universities engaged in aquaculture education are: ENFI, University of Larache, Hassan II Agronomic and Veterinary Institute. All these universities provide students with the possibility to take courses in fish farming, but none of them possess a wet lab with aquaria, basins or ponds. Hence, students get theoretical courses at the university and they have to acquire all practical experience (including practical aquaculture research) by working together with commercial companies. To some extent INRH offers them in their laboratories opportunities: e.g. Larache university carries out with a commercial company fish feed experiments in INRH laboratory in M'Diq. Also the new INRH shellfish laboratory in Amsa may create great opportunity to improve practical (applicable) aquaculture research.

Mohammed V university is now prepared to make funds available to build an aquaculture laboratory in Rabat. The university is also very much interested in an exchange programme with a Netherlands university in which both researchers and students take part. It would be recommended to start this exchange programme and make a joint effort (University Mohammed V in Rabat and WUR Wageningen seems to be the most logic combination) to investigate needs and options for the wet lab in Rabat and develop subsequently jointly the design, purchase of equipment, of the laboratory.

Special attention could be paid to INRH research in M'Diq on micro-algae research. In southern Morocco laboratories on micro-algae and hatcheries for shellfish also might hold promise for cooperation with Netherlands researchers (although these statements should be first verified!). While scientific laboratory research in these areas may have more opportunities to prosper in the Netherlands, Moroccan field conditions are far more appropriate for (commercial) production and applied research.

Dutch opportunities:

- ✓ Identification of laboratory needs in Rabat, design lab during exchange of researchers and students
- ✓ Delivering fish farm laboratory equipment and building the laboratory
- ✓ Course for fish farm technicians in e.g. sustainable aquaculture
- ✓ Exchange of scientists, researchers and students (micro-algae could be interesting!)

Moroccan partner(s):

- ✓ Universities
- ✓ INRH

4. Mussel farming

ANDA has put a lot of effort in making areas along the coast available for shell fish farming, including very promising sites in the Mediterranean. Companies are still new and not very experienced, but with Japanese and French support the obtained first results are promising: catch of seeds has been very satisfactory and growth high with meat % optimal in August (data from Cala Iris). Presently considerable investment is on its way in the Mediterranean (Amsa, Cala Iris) Due to the harsh conditions in many sites along the Moroccan coasts (waves, wind, currents and deep water), mussel production may require considerable effort and time to upscale the present experimental production into fully commercial production levels.

Dutch opportunities:

- ✓ Investment / joints ventures / creating own Moroccan companies in the Mediterranean areas as company is already operating in this area
- ✓ Delivering mussel farming equipment (seed collectors, machinery to get mussels into 'socks', mussel cleaners, mussel harvesting machines, etc.
- ✓ Processing and trade in mussels
- ✓ Technical assistance, including veterinary research for prevention, identification and treatment of diseased oysters.

Moroccan partners:

- ✓ ANDA (providing services to facilitate foreign investment, AMI's),
- ✓ Cala Iris
- ✓ INRH

5. Sea bass and sea bream farming

Sea bass (*Dicentrarchus labrax*) and sea bream (*Sparatus aurata*) are commonly farmed in the Mediterranean Sea (e.g. Spain, France, Greece, Turkey). Also meagre (*Argyrosomus regius*) is used (tested) in Morocco.

Both the European bass and the gilt-head (sea) bream are found in the Mediterranean Sea and the eastern coastal regions of the North Atlantic Ocean. Sea bass can reach sizes of up to 1 m in length and 12 kg in weight, though the most common size is only 1 to 2 kg. Sea bream commonly reaches about 35 cm in length (0.7 kg), but may reach 70 cm and weigh up to about 7 kg. Both species are widespread, are both cultured and fished and there are no major threats to its population.

Sea bass and sea bream are the most important fish species cultured in the Mediterranean, each contributing about 50% to the total production of just over 300,000 tons/year. World market prices for fresh whole seabass and sea bream were 6 to 6.5 US\$/kg in 2016. Competition with other Mediterranean fish producers is harsh, as long as production volume remains low (economy of scale) and restrictions on fish feed requirements keep imported fish feeds more expensive. Though, tax inequalities will be removed by 1/1/2018.

In elaborating business plans for this endeavour, one should also consider previous projects with sea bass and seabream farming, such as the Marost company failure in 2009, the plans of Kilic (Turkey) in 2014 to start with large sea bass farming (but as far as known not yet materialized) and the present performance of the only remaining sea bass farm in M'Diq.

Dutch opportunities

- ✓ Fish feed
- ✓ Trade
- ✓ Hatchery products and materials

Moroccan partners:

- ✓ AquaM'diq

6. Carp farming (development)

Presently extensive carp farming takes place in dams and ponds of farmers used for agriculture irrigation purposes, see 1. Carps can be farmed also in the high-altitude area. Carp farming is well established in rural Morocco as farmers use carp to keep their water storage ponds free of weeds (silver carp, grass carp are mainly used, sometimes also common carp). Government is now supplying carp fingerlings to farmers, but price is rather high, hatchery with ponds is poorly designed and production could be improved / become cheaper when modern techniques and systems (like RAS) will be applied.

Recently (in 2017) prices of carp have substantially increased due to high demand in Eastern Europe. Carp production could switch from present very extensive production methods to a slightly more sophisticated system in which production is increased by application of fish feed.

Dutch opportunities:

- ✓ Technical assistance for substituting present carp hatchery system (several)
- ✓ Delivering carp hatchery
- ✓ Carp feed

Moroccan partners:

- ✓ HCEFLCD
- ✓ GIZ
- ✓ Aliments et protein du Nord

7. Seaweed farming

In Mediterranean area seaweed farming is still in developing phase, but along the Atlantic coast Morocco is a world player in red seaweed production. Seaweed farming might economically be very profitable as over-harvesting has reduced Moroccan seaweed production; not clear why production not yet taken off. Relative cheap labour may make seaweed production in Morocco attractive (notwithstanding firm competition from other low wage (sub) tropical countries).

Red algae (*Gracilaria gracilis*) is a common weed in warm and temperate sea water all around the world. This weed is very easy to propagate (multiplication is done by braking of parts that grow into new individual plants), is tolerant to wide scope of environmental conditions, it grows fast (in Morocco growth is claimed to be between 5 and 10 %/day) and it has considerable economic value (main species for the global agar industry).

In the Netherlands in the last decade a lot of effort has been dedicated to developing seaweed production in the North Sea. A lot of the production technology can possibly be used in Morocco.

Opportunities:

- ✓ Research (WUR, Hortimare)
- ✓ Pilot projects for upscaling production and improved processing (WUR, Hortimare, ...)

Moroccan partner:

- ✓ Setexam,
- ✓ Cooperative de Marchica

c. Suitability of Rif area for aquaculture

As policy makers of the Netherlands has special interest in supporting development in the Rif area, for each of the above business opportunities a brief assessment is made of the suitability of the Rif:

Tilapia farming in water management	The Rif offers good possibilities for this activity in lower altitude areas.
Commercial tilapia farming	The present major tilapia farm is located just outside Rif area; probably enough opportunities to establish more tilapia farms.
Aquaculture training and education	Rabat seems the most obvious location for this activity.
Mussel farming	Most promising mussel production along the Moroccan Mediterranean coast in Rif area.
Sea bass and sea bream farming	Rif area possesses very suitable locations along the Mediterranean coast.
Carp farming	Rif: Yes, in principle suitable anywhere, as long as fresh water is available.
Seaweed farming	Very suitable areas along the Mediterranean coast.

Annexes

Annex 1 Travel programme Aquaculture mission in Morocco from 7-11-2017 to 14-11-2017

Date	Ville	Organisation	Heure	Nom	Fonction	telephone
7-11-2017	Rabat	Ambassade des Pays-Bas	08h00	Nico Visser	Conseiller Affaires Agricoles	
		Ministere de l'Agriculture et des Peches Maritimes	09h00	M. Bouchta Aichane	Directeur, Direction des Peches Maritimes	0537688244/46
		Agence Nationale pour le Dev. De l'Aquaculture	14h00	M. Amine Masnsouri M.Hicham Ouazzani	Chef de Service des Etudes Chef de Service Appui Technique	0538099700
		Haut Commissariat aux Eaux et Forets	16h00	M. Badr Laamiri	Chef de Service	0661484007
		Faculte des Sciences Rabat	18h00	Mohammed Belkacemi	Doyen	0661434425
8-11-2017	Casablanca	Institut National de Recherches Halieutiques	08h30	M. Idhalla	Chef de Departement	0661478558
		Consultation FAO	10h00	M. Abdellatif Orbi	Consultant	0661489510
	Oualidia	Complexe Lagunaire Sidi-Moussa	15h00	M. Pinclou	Directeur	0663460008
9-11-2017	Agadir	Centre Regional d'Investissement	15h00	M. Khalil Nazih	Directeur	0528230877
10-11-2017	Beni-Mellal	Grass Carp Project	09h00	M. Aziz El Moujtahid	Directeur	0661255371
	Azrou	CNHP et visite de ferme de truites	15h00	Mohamed Sadik	Chef de Service	0661910785
		Domaines (king) Ain Aghbal	16h30	M. Aziz Maychal	Gerant	0661062706/055
11-11-2017	Nador	Cooperative Marchika de la Pêche Artisanale	10h30	M. Maimoun Bouhssine	Directeur	0662190684
12-11-2017	El Hoceima	Cooperative Cala Iris	15h00	M. Fatih Ahmed	Responsable	0661082960
13-11-2017	M'diq	Aquaculture Center	09h30	M. Hassan Nhhala	Directeur	0623695260
		Aqua M'diq	11h00	M. Houssine Chadli	Directeur General	0661345983
14-11-2017	Tanger	FST, Tanger	09h00	M. Mohammed Addou M. Hicham Chaairi	Doyen Professeur Universite Larache	0661355725 0661497782
		Pisciculture du Nord (Tilapia Farm)	12h00	M. Mernissi	Gerant	0661300290
	Kenitra	NouneMaroc	17h30	Mme Asmae Bekkali	Directeur	0661165684

Annex 2 Moroccan aquaculture companies potentially interested in Dutch investment or support

	Name & contact details	Profile	Specie(s)	Requirements	Interest
1	Pisciculture du Nord Juan Lobo Torner T +212 6677.88.084 lobosum@hotmail.com	Tilapia fish farm producing annually around 200 tons of <i>Tilapia nilotica</i> between 400 and 600 grams individual weight. During the 10 years of operation has developed its own tilapia strain well-adapted to local circumstances, such as low winter temperature. Production system outdated, but still well functioning. Sister company produces its feed (fc 1.3 to 1.6). Company's location in the north of Morocco facilitates export to EU. Acceptance of tilapia by local market and difficulties in competing frozen tilapia from Asia are inhibiting its expansion at this moment.	Tilapia	Increasing tilapia sales upgrading RAS system	yes ?
2	AquaM'diq Housni Chadli Port de M'Diq GSM 06-6134.5983 housni.chadli@gmail.com www.aquamdiq.com	AquaM'diq is at this moment Morocco's only marine fish farm, producing around 200 tons of seabass per year in 14 cages located just outside the harbour of M'diq. Fingerlings and feed for fingerlings are imported, grow-out feed is purchased locally. Farmsite has a potential production of 400 tons/year, but marketing fish is the major problem, also because unfair competition due to tax disadvantage. Compared to other Mediterranean countries fish feed in Morocco is more expensive as land animal proteins in fish feed are prohibited, making the feed more expensive.	sea bass	fish feed market for seabass	? yes
3	Cala Iris Fatih Ahmed Port Cala Iris Beni Boufrah +212 6 6108.2960 GSM 06-6108.2960/5922.4575 totalcalairis@gmail.com	Well-organised cooperative of fishermen has invested years in establishing mussel production on longlines in protected part of the sea near the new harbour of Cala Iris. Mussel seed is abundantly available and growth of mussels is high: 6 to 7 cm in 7 months. Permissions are ready for building processing plant and increase production areas. Japanese (JICA) have invested in developing mussel farming, but now investment is needed, not only in mussel production equipment, but also in work boats, mussels harvester and purification, processing and packing plant.	mussels	investor in equipment and mussel processing and packing	yes
4	Marchica T 00212 6 6219,0684 T 00212 6 4237,0650 mnadori395@gmail.com	Cooperative producing sea weed (<i>Gracilaria gracilis</i>) on an apparently ideal site 10 km east from Nador city. Present artisanal scale production of less than 100 tons/year seems economically unattractive. However, production seems to be easily upgradable to 4000 tons/year at this site. As seaweed production is labour intensive and labour costs are relatively cheap, this business may have economic potential if well managed.	seaweed	investor	yes
5	Al Amal Lamdaghri Tarik T +212 6 7129.9869 alamal.cooperat@gmail.com	This cooperation of artisanal fishermen is specialised in off-shore, semi-submerged longline mussel production. Production level and available organization and infrastructure not known.	mussels	?	?
6	University Mohammed V Rabat Ahmed Yahyaoui	Largest and oldest university of Morocco is interested / can make available funds for building aquaculture research unit based on RAS technology.	fish species	research unit exchange students and researchers aquaculture course in NL	yes yes ?
7	HCEFLCD Mohammed Badr Laamiri Service de la Peche et de la Pisciculture Continentales 3, Rue Harroun Errachid, Rabat GSM +212 6 6148.4007 laamirimb@gmail.com	Plans to their Halieutis programme requires persons in the field with skills to develop small-scale aquaculture on a large scale.	tilapia carp	aquaculture course in NL fisheries course in NL	? ?
8	Setexam km 7, Rte de Tanger ElAssam Kenitra Tele : (212) 5 37 32 98 00 E-Mail : setex@setexam.com www.setexam.com	Setexam was founded in 1960 and specialized in the harvesting of seaweeds destined for the export. In 1968 a food grade agar-agar extraction plant with a capacity of 100 tons/year was established with the technical assistance of a Japanese partner. Seaweed collection takes place along the entire Moroccan coast. In 1988 the factory was completely renovated for the production of bacteriological and food grade agars.	seaweed	buyer	?
9	INRH Hassan Nhhala Centre Spécialise en Aquaculture Port Maritime de M'Diq T +212 6 2389.5260 nhhala@inrh.ma nhhala@gmail.com	INRH is national aquaculture research institutes with many branches all over Morocco. INRH will be responsible for pilot shellfish farm in Amsa. At this site also a laboratory and shellfish hatchery are now (November 2017) under construction.	shellfish marine fish	research/pilot production	?
10	GIZ Michael Gajo 2, Avenue Tour Hassan, 10 001 Rabat Tél. : +212 (0) 537 70 44 84 michael.gajo@giz.de giz-maroc@giz.de www.giz.de/marokko	GIZ has been working in Morocco since 1975 and opened an office in Rabat in 1999. GIZ is taking on commissions in Morocco from other clients, such as German Ministries and institutions, the European Union and Moroccan companies. GIZ has 130 staff in Morocco. Major project in Morocco was focussed on climate change (2013-2016). Development of fishfarming in 2 reservoirs (Hansali et Hassan II), supporting sustainable management of fish stocks (Bin El Ouidanne et Hassan Ièr) and fish farming in cages with coopératif "Tamaroute".	tilapia, carp	rural development	

11	Hassan II Agronomic and Veterinary Institute, Rabat Madinat Al Irfane B.P. 6202, Rabat Tél : (00 212) 0537 77 17 58/59 http://www.iav.ac.ma	Well structured education in aquaculture and fisheries science	fish species	research unit	yes
				exchange students and researchers	yes
				aquaculture course in NL ?	
12	University of Tanger/Larache Departement des Ressources Naturelles Hicham Chairi Faculte Polydisciplinaire de Larache +212 - 539.523 960 hicham.chairi@yahoo.fr +212 644 444 786	Education and research in aquaculture			?
13	ENFI Ecole Nationale Forestière d'Ingénieurs	Aquaculture education			?
14	Marokagar, S.A. M. Rachid Kettani 44 Rue Abou Baker Wahrani B.P. 2121 Casablanca 05 Tel: [INT+212] +2 623 611	Agar agar producer, not sure if still operational Address also can be: 12, rue Nisrine -ex Arras 20000 Casablanca 0522 260 541 - 0522 260 548	seaweed processor, agar agar		no ?
15	Asmak Nile Oulad Bourahmoun Souk Es Sebt Beni Mellal asmaknile@gmail.com +212 5234-26781 http://www.asmaknile.com	Company founded in 2013, producing fresh water fish in ponds.	Tilapia Silver carp Grass carp		?
16	Aliments et proteines du Nord Happy Fish	This factory makes use of the in Morokko abundantly available fish meal to produce food for cats, dogs and fish. The company was established in 2004, employs 50 people and has a production potential of 700 tons per year. The company is associated with Pisciculture du Nord. The fish feed they produce is called Happy Fish and is used for tilapia but also for seabass grow-out food.	Fishfeed manufacturer		?
17	Nounemaroc E: contact@nounemaroc.ma T: +212(05) 37 37 89 64 Quartier Municipal Industriel Lot 71, Kenitra www.nounemaroc.ma	Nounemaroc is a company specialised in the production of eel. The company has invested over 40 million Dirham to introduce innovative recirculation technology (RAS) in Morocco. Due to the application of the latest fishfarming technology eel can be offered a very well controlled environment in which they can be kept in high densities and grow fast. Nounemaroc is the first company realised in the framework of the Maroc Vert programme.	Eel	none	no

Annex 3 Netherlands aquaculture companies potentially interested in business in Morocco

Netherlands companies with potential interest in Moroccan aquaculture development					
	Name & contact details	Profile	Specie(s)	Products or services	Interest
1	Aqua Spark Achter Sint Pieter 5 3512HP Utrecht The Netherlands +31 (0)30 8200369 info@aqua-spark.nl www.aqua-spark.nl	Aqua-Spark is a global investment fund based in Utrecht, the Netherlands that makes investments in sustainable aquaculture businesses that generate investment returns, while creating positive social and environmental impact. The fund invests in small to medium enterprises that are working towards the production of safe, accessible aquatic life, such as fish, shellfish and plants, in a way that does not harm the health of the planet.	all aquaculture related activities	investment fund	?
2	Seafarm BV Adri Bout Jacobahaven 4 4493 ML Kamperland The Netherlands (+31) (0)113 371828 info@seafarm.nl http://www.seafarm.nl/	Bij Seafarm kweekt messchelpen en schelpdieren en is actief in visserij en viskweek. Door gemotiveerde personeel kunnen wij een hoge kwaliteit waarborgen. Seafarm heeft agenten in Spanje, Italië en Frankrijk waardoor een snelle levering op deze markten kan worden gegarandeerd. Seafarm ziet zichzelf als adviseur en/of exploitant van nieuw of om te bouwen schelpdieren opslagsystemen en kweekrijen, welke milieuvriendelijk en diervriendelijken efficiënt opgezet worden. door gebruik van innovatieve automatisering.	shellfish turbot	??	No
3	HESY Aquaculture B.V. Arie de Bond Bovendijk 35-Z 2295 RV Kwintshoek The Netherlands +31 (0) 174 220140 office@hesy.com www.hesy.com	HESY Aquaculture is one of the world's leading companies in design and turn key delivery of Recirculation aquaculture systems and conducts this worldwide. HESY has a large and well documented reference list which document more than 30 years of experience in design, installations and service of intensive re-circulation fish farms.	all fish species	RAS fish farms hatcheries	Yes
4	WUR, Wageningen University & Research (a) WMR Marnix Poelman marnix.poelman@wur.nl +31 317 487035 (b) Aquaculture&Fisheries Dept Johan Verreth johan.verreth@wur.nl +31 317 483.510 / 483.307 (c) CDI Peter van der Heijden peter.vanderheijden@wur.nl +31 317 481.394 (d) DLO Lolke Sijtsma lolke.sijtsma@wur.nl +31 317 480.220 (e) Animal Breeding and Genetics Hans Komen hans.komen@wur.nl +31 317 482.465	Wageningen University & Research (WUR) has a staff of 6,500 and 10,000 students from over 100 countries. They work everywhere around the world in the domain of food and living environment. The strength of WUR lies in joining forces of specialised research institutes and the university, leading to scientific breakthroughs that can quickly be put into practice. The scientific quality of WUR is affirmed by the prominent position we occupy in international rankings and citation indexes. Institutes within the WUR with relevance for aquaculture development in Morocco are: (a) WMR, Wageningen Marine Research with expertise in all aspects of marine finfish and shellfish farming and fishery, (b) Aquaculture and Fisheries Department, with expertise in education (BSc, MSc and PhD) in aquaculture and fisheries with a lot of expertise in Europe (RAS production systems and hatcheries) and pond farming (Asia and Africa) and (c) CDI given annually several courses for managers in aquaculture and fisheries all over the world. Other relevant subjects studied at the WUR are fish genetics (prof. dr Hans Komen) and seaweed production (Dr Lolke Sijtsma)	shellfish all fish species seaweed	Education & research MSc&PhD students aquaculture and fisheries training	yes
5	ACE Rene Remmerswaal Meulenveldt 4 5451 HV Mill The Netherlands T +31 485 32 43 43 F info@ace4all.com www.ace4all.com	Aquaculture Consultancy & Engineering (ACE) is specialized in design and construction of recirculation systems for aquaculture farms, as well as the supply of equipment needed for these farms. Hands-on experience is available with marine and fresh water fish, but also with shrimp, lobster and crab, shellfish and micro algae. ACE also provides full support to the clients before and after the design and construction phase. ACE has broad experience with all technical aspects of Recirculation Aquaculture Systems (RAS).	fish species micro algae	RAS fish farms production units	yes
6	Aquaculture experience Staatsspoor 17 3994 VD Houten T +31 30 63 81 790 hboon@aquaculture-experience.com www.aquaculture-experience.com	Aquaculture Experience has over 25 years experience in the international aquaculture and aquafeed industry. Hans Boon has worked as general manager, nutritionist, product manager, sales and marketing coordinator as well as in export development at operational and corporate level. Hans works on assignments like interim general manager of an aquafeed company in Greece and Coordinator and technical-commercial advisor to establish an aquafeed production unit for a Russian feed company, developing export markets in Asia and support feed ingredient suppliers.	all species	fish feed consultancy	yes
7	Catvis BV Martin Ooms Veemarktkade 8 5222 AE Den Bosch The Netherlands T +31 73 6213323 catvis@catvis.nl www.catvis.nl	Catvis BV was founded in 1985, with initial activities in the design and supply of recirculation systems for Catfish- hence our name- and soon after that for other species as well. Numerous systems were designed and built in the following years, both in The Netherlands as well as other countries. Catvis also soon diversified into the marine farming sector, rapidly expanding throughout the Mediterranean area. At present Catvis is known as a versatile, yet specialized, supplier to the international aquaculture industry, serving companies all over the world.	all fish species	Larval feeds Equipment fish farms Equipment off-shore farming	yes

8	Coppens Jan-Cees van der Leek P.O. Box 534 5700 AM Helmond The Netherlands +31 492 531 222 info@coppens.com www.coppens.com	Coppens International BV was established in 1993. From the headquarters in the Netherlands a team of experienced fish feed specialists develop high-quality, innovative fish feed programs for almost every species of farmed fish in all their development stages. Coppens is active in entire Europe and beyond. The combination of quality-conscious, efficient staff and our widespread network of specialized agents and distributors assures that 70 countries throughout the world are supplied with our feeds.	all fish species	fish feeds	yes
9	Hortimare Jan de Vries J. Duikerweg 12 B 1703 DH Heerhugowaard The Netherlands T: +31 72 888 8768 E: info@hortimare.com www.hortimare.com	Producer of seaweed seedlings. Strong in genetic improvement and research of weeds.	seaweed	Production & consultancy	?
10	Machinefabriek Bakker Dregweg 10 4401 LD - Yerseke The Netherlands info@wbakker.nl T +31-113-571521 www.wbakker.com	Machinefabriek Bakker designs and manufactures special machinery and installations for the shellfish industry since 1924. Supplying unique installations for efficiently producing and processing shellfish. Bakker is world leader in developing, fabricating and implementing installations onboard fishing vessels. Bakker also designs and develops processing units for shellfish working efficiently and economically, depending of the local conditions. Bakker also optimises existing installations and after the full project trajectory from concept to well considered fabrication.	shellfish mussels	machinery on board processing plants	yes
11	Seaweed Harvest Holland B.V. Kees Boender Verseputseweg 38 4321 TD Kerkwerve The Netherlands info@seaweedharvestholland.nl t.+31 (0) 631165249 www.seaweedharvestholland.nl	Seaweed Harvest Holland B.V. is a cooperation between de Zeeuwse Zeewierhandel, (wild seaweed harvesting), Spenekot Group, (producer of Dutch seaweed products), and Your Well (wholesaler in products based on European seaweeds) and was founded in 2015. Seaweed Harvest Holland's mission is to cultivate in an innovative and sustainable way all year long seaweed on different locations in the Eastern Scheldt and also to reproduce, process and trade the cultivated seaweed. The seaweed will be offered to health food and organic stores, fish and specialty shops, supermarkets, restaurants, feed and fertilizing manufacturers, processing industry and export. The ultimate goal: Everyone, every day some seaweed!	seaweed	consultancy on all aspects of production, processing and trade of seaweeds	yes
12	Dutch Oyster Association Jaap de Rooij Nederlandse Oestervereniging Postbus 124 4400 AC Yerseke Telefoon: +31 (0)6- 53 72 21 33 E-mail: info@zeeuwseoesters.nl	Organisation of Dutch oyster producers. Members might well be intersted in expanding their business to Morocco.	oysters	?	?
13	Til-Aqua Eric Bink Bong 20 5941 NL Velden The Netherlands T +31493470225 info@til-aqua.com www.til-aqua.com	Til-Aqua International is a tilapia hatchery producing Natural Male Tilapia (NMT) and special Broodstock using the so-called YY-technology, resulting in all-male Tilapia without the use of hormones. Silver and Red lines are pure Oreochromis niloticus. Advantages of this Tilapia YY technology are: No use of hormones, - Easy to useno difference with traditional broodstock, always >95% males in our Silver and Red strains, No ecological impact No decrease in fish resistance caused by hormone treatment of tilapia fry	tilapia	fingerlings	yes
14	Murre Technologies B.V. Jan Murre Zuidweg 18-20 4413 NM Krabbendijke The Netherlands Tel. +31 (0) 113 - 50 30 80 E-mail info@murre.nl www.murre.nl	EasyFarm is a complete system for the cultivation and harvesting of mussels in the vertical water column. Murre Technologies produces on-board rinsing lines for mussel cutters. They are rinsed in the hoppers and later undersized mussels are washed away. Murre Technologies distributes the product flow on to various machines. It is important that this is done gently and without causing damage. We have rotating scrapers, which have the advantage that they always unload. We also build longitudinal scrapers, which distribute the product in batches along the length of a conveyor belt.	mussels	on-board & onshore machinery for harvesting and processing of mussels	yes
15	COSTA Magnus van der Meer Plevierenweide 38 6708 BW Wageningen The Netherlands T +31 6 1297,4176 magnusvandermeer@gmail.com	COSTA offers consultancy services in the fields of aquaculture and fisheries. Aquaculture working experience includes production of catfish and eel in RAS systems, tilapia farming, fish nutrition and pond shrimp farming. In fishery work has been carried out on Nile perch and tilapia fisheries in Africa and in The Netherlands on eel, pike-perch, mullet, mussels and cockles fisheries. Next to training and research, COSTA writes business plans, feasibility studies and project design & management.	all species	training & research project design&management	yes
16	Fleuren&Nooijen Bert-Jan Roosendaal Eindhovensebaan 9 6031NB Nederweert The Netherlands T +31 (0) 495 626163 info@fleuren-nooijen.nl www.fleuren-nooijen.nl	Fleuren & Nooijen B.V. is a Dutch company established in 1985 as an African catfish fingerling hatchery, supplying the growing African catfish culture sector in The Netherlands and Germany. In recent decades, designing and constructing aquaculture recirculation systems (RAS), for both commercial as well as research purposes, and consultancy have become the main activities of the company. Fleuren & Nooijen has also established a successful joint venture in Kenya since 2010 (Jambo Fish Western Ltd.).	tilapia carp catfish zebrafish	RAS fish farms RAS research facilities aquaculture equipment	yes

17	SAS Karin van de Braak Kranestraat 99 5961 GX Horst The Netherlands T +31 (0)6 108 975 22 Karin@sasnet.nl www.sasnet.nl	Sustainable Aquaculture Solutions (SAS) is founded by Karin van de Braak in 2005. Services by SAS enable more sustainable operations through improving quality and productivity, improving market access, reducing risk, and preparing and verifying compliance to sustainability standards (e.g. ASC, GlobalGAP, MSC CoC). In a world with increasing limited natural resources and a growing population, SAS is playing a role in raising more awareness, developing innovative concepts and supplying effective and tailor-made solutions for the aquaculture industry.	all species	certification labelling	yes
18	Q-point BV Victor Volkers Zuidweg 38 2671 MN Naaldwijk The Netherlands T +31 174282888 V.Volkers@q-point-bv.nl www.q-point-bv.nl	Q-Point is an advisory company, specialized in food safety, traceability, and integrated quality management and value chain management. Our clients include aquaculture firms, retail companies, trade associations and public institutions. We guide aquaculture and agro-food chains in the implementation of: (1) Quality management systems (ISO 9001, -14001, -22000, -17025, etc.) (2) Food safety systems (HACCP, BRC, IFS, GLOBAL GAP fish, (3) Risk assessments, (4) ASC Sustainable Aquaculture System	all species	certification systems food safety systems	yes
19	De Heus Animal Nutrition Rubenstraat 175 6717 VE Ede The Netherlands T +31 (0)318 675 500 info@deheus.com www.deheus.com	De Heus Animal Nutrition is an international organization with a leading position in the animal feed industry. De Heus was founded in 1911. Since then, it has been our goal to help our customers move forward. During that time, De Heus Animal Nutrition has evolved from being a one-man business to one of the top animal nutrition suppliers worldwide. We now have production locations all over the world where we produce our nutritional products. After more than a 100 years the company is still owned and managed by the De Heus family.	fish species	fish feeds	?
20	Hendrix Genetics BV Neil Manchester Sporstraat 69 5830 AC Boxmeer The Netherlands T +31 485 801911 Neil.Manchester@hendrix-genetics.com www.hendrix-genetics.com	Hendrix Genetics is a leading multi-species breeding company dedicated to generating solutions for the animal protein sector. Hendrix Genetics is active in more than 100 countries, with operations and joint ventures in 24 countries and more than 2,500 employees. Since 2011 Hendrix Genetics owns two leading brands, Troutlodge and Landcatch, investing in 3 continents, delivering top genetics in over 60 countries. Troutlodge now commands over 25% global market share in rainbow trout eggs.	trout	genetics	yes ?
21	Holland Aqua BV Frans Aartsen Floras traat 6 5715 AK Lierop The Netherlands T +31 492 776089 F info@hollandaqu.nl www.hollandaqu.nl	Holland Aqua offers consultancy and project management in aquaculture, air and water treatment. We specialize in supply chain management, business analyses, quality systems, grant applications and aquaculture engineering. Holland Aqua assembles state of the art fish farms with low environmental impact and high productivity, based on local production demands combining local as well as imported materials. Holland Aqua represents 20 years of experience in international aquaculture projects.	all species	recirculations systems	yes
22	HZ University of Applied Sciences Jouke Heringa Edisonweg 4 4382 NW Vlissingen The Netherlands T +31 118 489473 F jouke.heringa@hz.nl www.deltacademy.nl	The HZ University of Applied Sciences has been active in the field of practice-oriented aquaculture research for 12 years. The Group cooperates with regional aquaculture companies and institutes and has a body of knowledge in saline sustainable aquaculture. We mainly work with halophytes, polychaetes, micro- and macro algae and shellfish. Research is done in close collaboration with the aquaculture industry (mostly SME's). We have state of the art experimental facilities and modern laboratories.	fish species shellfish species	training & research	yes ?
23	Kamstra Consult Andries Kamstra Grote Buitendijk 296 1991 SX Velsbroek The Netherlands T +31 6 25036576 andries.kamstra@ziggo.nl www	The experience of Andries Kamstra in fish farming covers a period of 30 years and started with an education in Fisheries & Aquaculture at Wageningen University. In his career as a researcher he has been working on a wide range of practice oriented subjects mainly supporting farmers and often in an international setting. As an entrepreneur he has started and managed a number of innovative fish farms which has given him a broad perspective on all aspects of commercial fish farming.	all species	consultancy	yes
24	Roem van Yerseke Pieter Gijssen Roem van Yerseke B.V. Groeninx van Zoelenstraat 35 4401 KZ Yerseke The Netherlands Tel +31 (0)113 57 77 00 info@roemvanyerseke.nl www.zeelandsroem.nl	Zeeland's Roem is Europe's largest seafood processor. Mussels, oysters and prawns play the leading roles. We constantly work on novel cultivation methods, quality processes and optimal control of food safety. Large capacity and precise climate control allow us to guarantee optimal processing and packaging of our products. Researching the breeding and cultivation of seafood on and offshore for many years resulted in the construction of our own unique hatchery for crustaceans and shellfish.	oysters mussels	production trade	yes no
25	Viqon Victor Bierbooms Burgemeester Krollaan 93 5707 BB Helmond The Netherlands T +316 53250229 victor@viqon.com www.viqon.com	VIQON Water Solutions is a consulting company founded in 2010 and has since then realised projects in Europe, North America, Africa and the Middle East. VIQON water solutions is specialised in fish farm engineering and project realization. It has developed a unique denitrification system that enables fish farmers to reduce water usage with more than 90%. This feature gives farmers the opportunity to develop aquaculture projects in region with limited water supply or to consider marine applications.	all	recirculations systems	yes

26	Prins & Dingemanse Postbus 63 4400 AB Yerseke Koringaweg 39 4401 NT Yerseke +31 (0)113 572 910 info@prinsendingemanse.com	Prins & Dingemanse is based in Yerseke, the centre of shellfish farming in the Netherlands. We farm oysters and mussels since 1880. 137 years of dealing respectfully with pure, natural products is reflected in our working method and in the broad range of quality products. We always look for the best products in our own cultivation, but also elsewhere in the world. Next to mussels and oysters our shellfish assortment consists of many other shell fishes like cockles and palourdes from the Mediterranean.	mussels oysters palourdes	production trade	no / ?
27	Anova Seafood BV Hambakenwetering 3 5231 DD 's-Hertogenbosch THE NETHERLANDS Phone: +31 73 7502000 E-mail: anova@anovaseafood.nl www.anovaseafood.com	At Anova Seafood, we believe we can make pure & responsible fish choices accessible for every consumer and provide a sound income for our fishermen and seafood farmers. By continuously leading the way in sustainability and innovation, we create reliable and performance driven value chains. The Anova assortment includes an extended range of natural fish products. We trade in over 20 species, among them tilapia, Nile perch, seabass and sea bream. We source our seafood from all over the world.	tilapia	trade	?
28	Skal Biocontrole Kantoorgebouw "Leickert" Dr. Klinkertweg 28a 8025 BS Zwolle The Netherlands tel.: 038-426 8181 http://www.skal.nl	De volgende vormen van aquacultuur kunnen biologisch worden gecertificeerd: het kweken van vis, weekdieren als mosselen en oesters, maar ook zeewier en algen. In het verleden mochten biologische micro-algen alleen gebruikt worden als ingrediënt voor biologisch veevoer, tegenwoordig mag het ook gebruikt worden in biologische levensmiddelen. Op onze website kunt u alles vinden over de eisen die gesteld worden aan de verschillende soorten biologische aquacultuur.	all species	certification	?
29	Noordzeeboerderij Eef Brouwers eefbrouwers@noordzeeboerderij.nl +31(0)6 24 56 55 46 www.noordzeeboerderij.nl	Seaweed forms the basis for a promising blue-green economy; local, sustainable, healthy and new opportunity for the European economy. It offers an extraordinary offshore and onshore opportunity and is applicable to a wide variety of categories such as tasty food, renewable resources and important ecosystem services. The North Sea Farm Foundation is a non-profit organisation aimed at realising a sustainable seaweed industry in the Netherlands and surrounding EU countries	seaweed	consultancy	yes
30	Skretting Hans Vink hans.vink@nutreco.com +31 485 589 499 +31 653 847 604	Skretting is the global leader in providing innovative and sustainable nutritional solutions for the aquaculture industry. We deliver outstanding feeds and services worldwide for sustainable production of healthy and delicious fish and shrimp. Skretting is active in several African countries, e.g. Nigeria, Zambia and Egypt.	fish and shrimp	fish feed	?
31	BioMar Joost Blom Sales Manager Email: job@biomar.dk Tel: +31 621 29 38 81 / Fax: +31 180 64 90 72	BioMar is one of the leading suppliers of high performance fish feed to the aquaculture industry worldwide. In addition to the production facilities, BioMar also has numerous research and development facilities of its own, covering diverse geographical locations with production facilities across the globe. The factory in Spain is located in Duenās near Valladolid in the central part of Spain. It primarily serves the Iberian Peninsula and produces feed for among other species trout, sea bass, sea bream, meagre and turbot.	fish and shrimp	fish feed	?

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